Replacement Page 1, 1st Paragraph

BACKGROUND OF THE INVENTION

The invention relates to a hard metal for tools for mechanical working of, in particular, stone, concrete, and asphalt as well as a tool that is furnished with such a hard metal.

Replacement Page 3, 3rd and 4th Paragraphs

SUMMARY OF THE INVENTION

The invention has the object to provide a hard metal or a hard metal-equipped tool with improved properties and performance.

This object is solved by a hard metal having: ~~the features of claim 1, of claim 6 or claim 13 as well as a tool according to claim 28~~

a magnetic saturation (σ or $4\pi\sigma$, in units of microtesla times cubic meter per kilogram, respectively) as a function of the Co proportion (X) in % by weight of the hard metal in a range of $\sigma = 0.11\ X$ to $\sigma = 0.137\ X$ or $4\pi\sigma = 0.44\ \pi\ X$ to $4\pi\sigma = 0.548\ \pi\ X$; or

having a coercive field strength up to 30.0 kA/m and a magnetic saturation (σ or $4\pi\sigma$, in units of microtesla times cubic meter per kilogram, respectively) as a function of the Co proportion (X) in % by weight of the hard metal in a range of $\sigma = 0.11\ X$ to $\sigma = 0.130\ X$ or $4\pi\sigma = 0.44\ \pi\ X$ to $4\pi\sigma = 0.520\ \pi\ X$; or

having a binder containing at least 5 % by volume nanoparticles of ordered phases of W, Co, and/or C and the hard metal has a magnetic saturation (σ or $4\pi\sigma$, in units of microtesla times cubic meter per kilogram, respectively) as a function of the Co proportion (X) in % by weight of the hard metal in a range of $\sigma = 0.11\ X$ to $\sigma = 0.137\ X$ or $4\pi\sigma = 0.44\ \pi\ X$ to $4\pi\sigma = 0.548\ \pi\ X$.

The invention is also characterized by a tool comprising least one cutting element, wherein the cutting element is comprised of a hard metal according to one of the three hard metals described above.

Replacement Page 3, 5th Paragraph

By lowering the magnetic saturation to the range of $\sigma = 0.11$ X to $\sigma = 0.137$ X or $4\pi\sigma = 0.44\ \pi$ X to $4\pi\sigma = 0.548\ \pi$ X ~~claimed in claim 1~~, in the hard metals of the aforementioned kind, in particular, coarse-grain hard metals, an increase of the transverse rupture strength is achieved in contrast to conventional state of research. Despite the low carbon contents, no macro ranges of η-phases are formed in this connection. The performance improvement is effective in particular for hard metals with coercive field strength values of up to 9.5 kA/m, even more up to 8 kA/m, preferably however in the range of 1.6-6.4 kA/m. In this connection, the average grain size of WC is preferably to be selected from a range of 0.2 µm to 20 µm, even better from a range of 2 µm to 20 µm, and especially preferred from a range of 4 to 20 µm.

Replacement Page 4, 1st Full Paragraph

It was found that for reaching the preferred properties in hard metals with relatively thin intermediate binder layers or high coercive field strength values of 17 kA/m up to 30 kA/m, the W concentration in the binder must be even somewhat higher so that the binder of such hard metals is effectively strengthened. This means that the values of the magnetic saturation of such hard metals according to the invention are to be selected still lower than for especially coarse-grain hard metals, i.e., must be selected from the range <u>of $\sigma = 0.11$ X to $\sigma = 0.130$ X or $4\pi\sigma = 0.44\ \pi$ X to $4\pi\sigma = 0.520\ \pi$ X</u> ~~claimed in claim 6~~.

Replacement Paragraph, Bridging Pages 4 and 5

When embedded nanoparticles in the binder in hard metals having a magnetic saturation within the ranges that are ~~range~~ claimed ~~in claims 1, 6, and 13~~ reach a magnitude of at least 5 volume % of the binder, an entirely unexpected number of mechanical properties such as hardness, fracture toughness, breaking strength are significantly greater in comparison to those of conventional hard metals and, in particular, are independent, against all expectations, of the coercive field strength values. This holds true for coarse-grain as well as for fine-grain hard metals and even for such metals that are used for cutting metals.

Replacement Page 6, 3rd through 6th Paragraphs

Also, proportions of up to 1.5 % by weight, respectively, of Cr, [No] Mo, V, Zr, and/or Hf in the form of carbides and/or solid solutions in the binder lead to an improved service life.

By employing coated diamond grains, the hard metals according to the invention with high W contents in the binder can effect a significant performance improvement in the group of the ultra-hard hard-metal materials and can be used successfully because the combination of the high tungsten concentration in the binder with low magnetic saturation significantly suppresses a dissolution process of the coating of the diamond grains. According to an advantageous configuration of the invention, the hard metal contains 3 % by volume up to 60 % by volume diamond grains in a coating of carbides, carbonitrides, and/or nitrides of Ti, Ta, Nb, W, [Co] Cr, Mo, V, Zr, Hf and/or Si.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and details are explained in more detail with aid of the following examples 1 to 4 and Figs. 1 to 4.

Fig. 1 shows the limit values of the magnetic saturation for the claimed ranges ~~range defined in claims 1 and 13~~.

Fig. 2 shows the binder with nanoparticles.

Fig. 3 shows electron diffraction of the binder, wherein the squares are reflexes of the fcc-cobalt, the circles are reflexes of the nanoparticles, and the cross is the center relative to the electron beam.

Fig. 4 shows chisels with new and conventional hard metals as worn during the field test under identical working conditions.